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OFFICE OF THE SECRETARY

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Federal Communications Commission
445 12th Street, S.W. Room C750
Washington, DC 20554

Dale Hatfield
Chief, Office of Engineering and Technology
Federal Communications Commission
445 12th Street, S.W. Room C155
Washington, DC 20554

Re: Response to Ex Parte Submission by BroadwaveUSA in ET Docket No. 98-206

Dear Messrs. Abelson and Hatfield:

On September 13, 2000, BroadwaveUSA, a party to the above-referenced proceeding and joint applicant with Northpoint Technology, Ltd. (jointly "Northpoint") for terrestrial broadcasting authorizations in the 12.2-12.7 GHz band, filed an *ex parte* letter that includes a number of misleading and incorrect assertions with regard to the potential for harmful interference by Northpoint transmissions to Direct Broadcast Satellite ("DBS") reception throughout the United States.¹ EchoStar Satellite Corp. ("EchoStar") and DIRECTV, Inc. ("DIRECTV") jointly submit this response to provide the Commission with additional information that demonstrates the misleading content of Northpoint's letter.²

The gravamen of Northpoint's letter is that the standard for assessing harmful interference from Northpoint's terrestrial transmissions into DBS receivers in the 12.2-12.7 GHz band ("Ku-band") should be based on the Commission's UHF-VHF broadcast rules for allocating additional Digital Television ("DTV") channels, *i.e.*, Section 73.623 of the Commission's Rules, 47 C.F.R. § 73.623. More specifically, Northpoint argues that the DTV-to-DTV Carrier-to-Interference ("C/I") ratio, also referred to as the "Desired to Undesired ratio" ("D/U") by the Commission, for co-channel interference should be set to +15 dB simply because

¹ Letter from Sophia Collier, BroadwaveUSA to Donald Abelson, Chief – International Bureau, FCC, and Dale Hatfield, Chief – Office of Engineering and Technology, FCC, September 13, 2000 ("BroadwaveUSA Letter").

² While the BroadwaveUSA letter and other recent *ex parte* submissions of Northpoint contain a number of inaccurate and misleading legal and technical arguments, we have limited our response to the technical issues raised by the subject filing.

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“DBS is a broadcast service.”³ Northpoint itself seems surprised to have stumbled on the 15 dB DTV standard because it admits that it “did not plan to advocate [the standard] for Northpoint-DBS sharing.”⁴ Nevertheless, it now believes that the Commission’s development of DTV-to-DTV digital co-channel broadcast interference standards should apply to the co-channel operation of Northpoint’s proposed terrestrial system and DBS in the Ku-band.

As a threshold matter, Northpoint’s proposal is fundamentally misplaced because, as EchoStar and DIRECTV have repeatedly observed, an international and U.S. standard already exists for assessing harmful interference into DBS receivers. As reflected in Recommendation ITU-R BO.1444, aggregate interference from all interference sources – terrestrial or otherwise – should not be responsible for more than a 10% increase in DBS link unavailability. Northpoint has not explained, because it cannot, why this standard should not be applied to the interference created by its proposed system. In addition, Northpoint’s flailing efforts to latch onto the DTV standard defy sound engineering principles and common sense.

The proceeding in which the co-channel DTV interference standard was developed was intended to establish a Table of Allotments for UHF-VHF DTV, to provide procedures for assigning DTV frequencies in the UHF-VHF bands, and to offer plans for spectrum recovery in those bands.⁵ The analytical predicate for Section 73.623(c), as noted, is OET Bulletin No. 69, which is intended to “provide[] guidance on the implementation and use of Longley-Rice methodology for evaluating TV service coverage and interference....”⁶ As OET Bulletin No. 69 itself states, the Longley-Rice radio propagation model “is used to make predictions of radio field strength at specific geographic points based on the elevation profile of terrain between the

³ BroadwaveUSA Letter at 1.

⁴ *Id.* at 2.

⁵ See, e.g., *In the Matter of Advanced Television Systems and Their Impact Upon the Existing Television Broadcast Service*, MM Docket No. 87-268, Sixth Report and Order, 12 FCC Rcd. 14588 (1997) (“*Sixth Report and Order*”); see also OET Bulletin No. 69, “Longley-Rice Methodology for Evaluating TV Coverage and Interference,” July 2, 1997. OET Bulletin No. 69 was intended to “serve as a guide for parties preparing submissions for possible actions that [the Commission] might take subsequent to the development of the initial DTV Table.” *In the Matter of Advanced Television Systems and Their Impact Upon the Existing Television Broadcast Service*, MM Docket No. 87-268, Order, 12 FCC Rcd. 9688 (1997) at ¶ 3 (“*Order*”). That bulletin was issued concurrently with the *Sixth Report and Order*, and includes criteria for evaluating UHF-VHF interference in co-channel, adjacent channel and analog/digital situations. These criteria are embodied in Section 73.623(c) of the Rules.

⁶ OET Bulletin No. 69 at 1.

transmitter and each specific reception point."⁷ Most importantly, this version of the Longley-Rice model is designed to operate in the VHF and UHF bands, *i.e.*, channels 2-6, 7-13 and 14-69.⁸ Indeed, the planning factors the Commission specified in its *Sixth Report and Order* refer only to the VHF and UHF bands.⁹ Further, the parameter values used to implement the Longley-Rice Fortran Code for this particular analysis include relative permittivity of ground, surface refractivity, signal polarization, height of TV receiving antenna above ground, and climate code.¹⁰ All of these factors and all of the parameters used by the Longley-Rice model were varied as a function of frequency – but only in the VHF-UHF bands.

Moreover, before the C/I standard adopted by the Commission for use in the UHF-VHF bands could be applied to the Ku-band, a number of important technical issues first would have to be addressed to reflect the very different operational features of systems in the two bands. These include:

- Different frequency bands (VHF-UHF vs. Ku-band)
- Different RF signal bandwidths (6 MHz vs. 24 MHz)
- Differing frequency plans (non-overlapping vs. interleaved channels)
- Different types of polarization (linear vs. circular)
- Different digital modulation methods (8-VSB vs. QPSK)
- Differing alignments of the wanted and interference paths
- Differing propagation and fading statistics (the effects of clutter, both natural and man-made, are far more pronounced above 1 GHz)

⁷ *Id.*

⁸ *Id.* at 4. See also *In the Matter of Technical Standards for Determining Eligibility for Satellite-Delivered Network Signals Pursuant to the Satellite Home Viewer Improvement Act*, ET Docket No. 00-90, Notice of Inquiry, FCC 00-184 (May 26, 2000), at ¶ 10, Tables 1 and 2. Further, studies have been conducted to collect environmental noise data to confirm the Longley-Rice predictive models. These studies were conducted at 162 MHz. See Rubinstein, Thomas N., "Clutter Losses and Environmental Noise Characteristics Associated With Various LULC Categories," IEEE Trans. Broadcasting, Vol. 44, No. 3, September 1998, at 286-293. The LULC (Land Use Land Cover) database produced by the United State Department of the Interior, Geological Survey, categorizes land clutter for purposes of quantifying the effects of ground clutter on propagation path losses in the UHF and VHF bands.

⁹ *Sixth Report and Order* at Appendix A.

¹⁰ *Id.* at 8., Table 4.

It is clear, therefore, that the co-channel interference standard for DTV stations in the UHF-VHF broadcast bands was never intended to serve as a basis for determining interference protection levels outside those bands.

Northpoint asserts in its letter that "[d]igital terrestrial broadcasters use 8-VSB modulation in contrast to the QPSK modulation used by satellite providers and Northpoint. 8-VSB, a 'multi-level' modulation scheme, is more sensitive to interference than QPSK. Since 8-VSB is less robust than QPSK and 15 dB is sufficient for 8-VSB, it is obviously more than sufficient for QPSK."¹¹ Based on this statement, Northpoint falsely concludes that there is a "solid precedent" for its proposal regarding a 20 dB "mitigation zone" around Northpoint transmitters. Even if both Northpoint and DBS were using 8-VSB, a 15 dB D/U ratio is unsupportable under the Commission's Rules. The 15 dB value applies only in the case where the carrier-to-noise ratio of the desired signal exceeds 28 dB.¹² For carrier-to-noise ratios below 28 dB, Section 73.623(c)(3) of the Rules provides a formula for computing the minimum acceptable value of D/U for DTV-to-DTV interference as a function of carrier-to-noise ratio ("S/N"). If applied to the case of Northpoint interference to DBS and using carrier-to-noise ratios typical of DBS downlinks, the Commission's Rules would require a D/U of at least 23 dB, not 15 dB. The Commission's D/U values correspond to an interference level that is only a few tenths of a dB above the threshold at which 8-VSB synchronization is lost and the received picture freezes. Accounting for inevitable satellite signal fading due to rain, as well as the normal variation of desired signal strength to geographically disparate DBS subscribers, the 23 dB value for D/U is inadequate by at least 5-7 dB. Accordingly, based on this calculation alone, a D/U value of 28-30 dB or higher (not 15 dB) is the bare minimum required to protect DBS systems.¹³

Further, the Commission's D/U value assumes only a single, strictly co-channel source of interference. The DBS frequency plan features 24 MHz-wide RF channels with adjacent-channel carriers separated by only 14.58 MHz. This leads to a 9.42 MHz overlap between the

¹¹ BroadwaveUSA Letter at n.2.

¹² The original laboratory measurements that established the 15 dB D/U value were carried out with a carrier-to-noise ratio of about 50 dB so that noise, as distinct from interference, was negligible.

¹³ The equivalent steady state C/I ratio required to protect an existing QPSK DBS satellite signal from one NGSO system is typically 27 dB. While it could be argued that the Commission's Rules apply to a multi-level VSB signal that is less robust than QPSK, the Commission would be expected to assure protection of DBS in the future when the industry might use higher-level modulation schemes that are less robust than 8-VSB.

RF bandwidths of adjacent channels. This overlap is not a problem in the case of interference from other DBS systems because adjacent satellite channels use the opposite circular polarization to obtain about 25 dB of interference discrimination. However, assuming Northpoint also uses an overlapping dual-polarization frequency plan but with linearly-polarized signals, polarization discrimination against adjacent channel interference in the upper and lower channel overlap region would be no better than for co-channel interference, *i.e.*, 3 dB or less. Moreover, given the relatively “flat” power spectra of digital signals, the aggregate Northpoint interference into a given 24 MHz DBS channel is thus about $[(24 + (2 \times 9.42))/24]$ 1.8 times, or 2.5 dB, higher than from the single co-channel Northpoint signal. Allowing for the aggregate Northpoint interference, the “single entry” D/U ratio for Northpoint must be raised to at least 30-32 dB.

Based on these analyses, it is clear that the origin of the terrestrial DTV interference standard and its possible application to the Ku-band requires further examination. Moreover, while it is evident that a “30 dB proposal” is far more appropriate than the 20 dB proposal offered by Northpoint, a thorough technical review would be needed before any conclusions could be drawn about the applicability of the DTV standard to the Northpoint-DBS sharing situation.

However, a U.S.-advocated, internationally accepted Broadcasting Satellite Service interference criterion already exists that can be used to assure adequate protection – without requiring such review or new studies. This important and relevant international standard for co-channel interference is reflected in Recommendation ITU-R BO.1444. The principal criterion used here as the basis for the derivation of transmit power limits for co-channel stations is that the aggregate interference – from all sources – should not be responsible for more than a 10% increase in link unavailability.¹⁴ Adequate protection of DBS customers therefore demands that all customers experience no more than a 10% increase in their unavailability (outage time) due to the combined or aggregate effects of NGSO-FSS and Northpoint (or other terrestrial source) interference.

In the case of NGSO-FSS or Northpoint interference into DBS receivers, the extent to which unacceptable levels occur is based largely on the combined characteristics of rain fades and the interference. When the signal from the satellite is attenuated by rain, and the clear sky margin has been reduced by interference, the result is an increase in satellite signal unavailability and poorer service. As noted above, rain fades are not a factor in assessing VHF-UHF path loss. Put differently, interference from Northpoint signals is harmful to DBS systems when the resultant decrease in the satellite-to Earth (downlink) budget margin causes the E_b/N_0 (bit error ratio) to exceed the specified decoding threshold either more frequently or for longer periods of

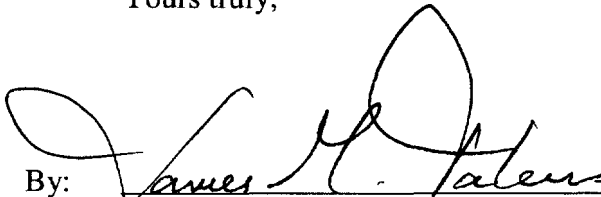
¹⁴

See CPM, Chapter 3, ¶ 3.1.3.1.3; *see also* Recommendation ITU-R BO.1444.

time. This is the correct and appropriate measure for determining unacceptable interference levels into a satellite system, not Section 73.623 of the Rules.

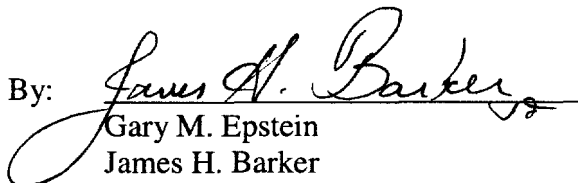
The Commission must not be misled by arguments that are misplaced or simply technically incorrect. The VHF-UHF broadcast co-channel interference standard now being espoused by Northpoint is just such an argument, because it is plainly not applicable in this case. Rather than continuing to grasp for straws, Northpoint's energies would be far better spent on working constructively with the DBS industry on an independent testing plan to measure Northpoint interference into DBS systems.

Yours truly,

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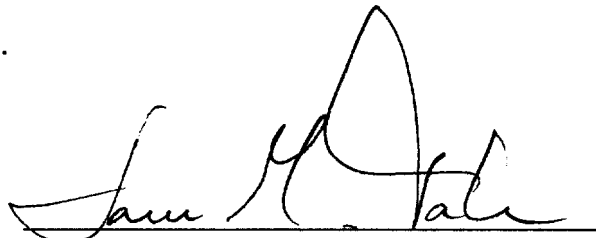
I, James M. Talens, hereby certify that the foregoing pleading was served this 11th day of October, 2000, by hand delivery to the following individuals at the Federal Communications Commission, 445 12th Street, S.W., Washington, D.C.:

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